

Innovative Guidance–Navigation System to Support Environmental Sampling and Mapping

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Environmental Issue Being Addressed

It is imperative to accurately reference sample locations to their respective data values, especially when high-density grid patterns are needed to precisely identify smaller zones of contamination. However, establishing sampling grids requires significant time. The use of a Global Positioning System (GPS) is not always an option since it will not work indoors or next to buildings. A non-GPS based guidance and data collection system, allowing an operator to immediately traverse a grid pattern of their choice while observing data in real time, would significantly reduce time in the field while maintaining a high level of accuracy.

Scientific Approach to Resolving the Issue

Goals were established to meet project specifications. Existing guidance–navigation systems were researched to understand the state of the art and explore their relationship to established goals. While several systems did exist, none had the combination of attributes that met the project goals. A laser system was identified as having the most accurate positioning and the longest range for tracking a target. Integrating the operator's real-time heads-up-display (HUD) was a difficult task to overcome. The most challenging issue was to determine a method for linking all incoming data. This was resolved by using a mathematical formula that computed the velocity of the operator's traverse, determined by the laser tracking device, to correctly reference each data point.

Partnerships in Both Conducting the Work and Applying the Results

Region 5 established an agreement with the Department of Energy at Argonne National Laboratory (ANL) to develop this project. ANL also sought other assistance including DMC, Inc.; University of Zurich (Switzerland); Leica Instruments (Switzerland); MicroOptical Corporation; and Albacomp, Inc. (adaptation of HUDs). Presentations introducing the system were given to On-Scene Coordinators so that the U.S. Environmental Protection Agency (U.S. EPA) and their contractors could apply this technology.

Impact the U.S. EPA Science Has Made or Expects to Make on the Issue

This system is currently configured to operate with several geophysical and radiological instruments used at environmental sites. Additional instruments could be configured to work with the system after slight modifications. The design of the system was built with the intention

that other scientists could apply the technology without significant expense. For example, the most expensive part of the system (the laser) could be rented at an engineering supply facility so that only minor parts of the system might be purchased to obtain an operational system.